

THE UNIVERSITY OF TEXAS AT AUSTIN

**RECOMMENDATION FOR CHANGE IN ACADEMIC RANK/STATUS**Name: Tiwari, Mohit EID: mt28295 Present Rank: Assistant ProfessorYears of Academic Service *(Include AY 2018-19 in each count)*:At UT Austin since: 9/1/2013 (month/day/year) Total Years at UT Austin: 6In Present Rank since: 9/1/2013 (month/day/year) Total Years in Present Rank: 6*Tenure-track only:*Number of Years in Probationary Status: 6Additional information: N/APrimary Department: Electrical and Computer EngineeringCollege/School: Engineering, Cockrell School ofJoint Department: N/ACollege/School: N/AOther Department(s): N/ARecommendation actions<sup>1</sup>:By Budget Council/Executive Committee: PromoteVote<sup>2</sup> for promotion 32; Against 0; Abstain 3; Absent 0; Ineligible to vote 2By Department Chair: PromoteBy College/School Advisory Committee: PromoteVote<sup>2</sup> for promotion 7; Against 0; Abstain 0; Absent 0; Ineligible to vote 0By Dean: PromoteAdministrative Action: Promote to Associate ProfessorDate Action Effective: September 1, 2019

(To be submitted to the Board of Regents as part of the annual budget.)

By: Mammi M. Li

For the President

Date: February 15, 2019<sup>1</sup>See "Chart of Recommended Actions" for eligible recommended actions applicable to specific conditions and administrative levels.<sup>2</sup>Record all votes for and against promotion, abstentions by eligible voting members, and the number of absent eligible voting members. The number of committee members ineligible to vote should also be recorded. Enter zero where it would otherwise be blank.



The University of Texas at Austin

**Cockrell School of Engineering****Dean's Assessment****Mohit Tiwari**

Department of Electrical and Computer Engineering

Cockrell School of Engineering

Dr. Mohit Tiwari received his BTech in computer science and engineering in 2005 from the Indian Institute of Technology, Guwahati, and his MS and PhD in computer science from the University of California, Santa Barbara in 2010 and 2011, respectively. He was a post-doc at the University of California, Berkeley for two years before joining the Department of Electrical and Computer Engineering (ECE) as an assistant professor in September 2013. If promoted to associate professor in September 2019, he will have accumulated six years of probationary service.

Dr. Tiwari's research focuses on developing secure computer systems. The proliferation of computer systems, including social and cloud computing, has exacerbated security vulnerabilities. Traditional techniques of patching vulnerabilities as they are identified is no longer a sustainable approach to building secure computer systems that are needed for the healthcare, election, and mobile computing systems of the future. Dr. Tiwari has made important advances toward developing the hardware and software systems necessary to protect data. Important developments include architectural mechanisms that enable information-leak-free hardware enclaves, containerized data for web services, and anomaly-detection mechanisms. His work is directly related to one of the Cockrell School's four priority research areas: advancing intelligent systems and man-machine symbiosis.

Ten external letters were submitted as part of the promotion dossier, with six letter writers selected by the budget council. Nine letter writers are current or previous faculty members at peer universities in the US, and one is a principal research scientist at Visa Research.

Several connections exist between the letter writers and Dr. Tiwari, but I consider all of them to be arm's length reviewers:

- John Kubiawicz (UC Berkeley) is technically not arm's length, as he is a co-author on a 2013 conference paper. As explained in the dossier, Dr. Tiwari was a post-doc at Berkeley when the research was conducted and Dr. Kubiawicz was the co-advisor of one of the graduate students with whom Dr. Tiwari collaborated directly. However, Dr. Tiwari did not collaborate directly with Dr. Kubiawicz.
- In his letter, Onur Mutlu (ETH Zürich and Carnegie Mellon) refers to a 2016 invited paper that summarized the topics presented during a conference session that he co-authored with Dr. Tiwari. This paper was a compilation of information presented by others and represents an editorial, rather than technical, collaboration.
- David Brooks (Harvard), Scott Mahlke (Michigan), Moinuddin Qureshi (Georgia Tech), and Dr. Tiwari are associated with C-FAR (Center for Future Architectures Research) at the University of Michigan. The center engages faculty at many universities (Michigan, Columbia, Duke, Georgia Tech, Harvard, Illinois, MIT, Princeton, Stanford, UC-Berkeley, UCLA, UC-San Diego, UT, Virginia, and Washington), and it does not appear that Dr. Tiwari has collaborated directly with any of the letter writers.

Teaching

While in rank, Dr. Tiwari taught one required undergraduate course and one graduate elective. He also organized a Freshman Research Initiative stream through the College of Natural Sciences, and served as a mentor. The CIS data from the FRI courses will not be addressed, because Dr. Tiwari was not directly responsible for teaching the courses.

Dr. Tiwari's instructor ratings have oscillated between 3.5 and 4.6 in the undergraduate course. In his teaching statement, Dr. Tiwari addressed the challenges he has faced in teaching the embedded systems course and the changes that he has made to improve the student satisfaction. He solicits feedback from the students throughout the semester, and appears to be receptive to their suggestions. His most challenging semester (Spring 2017) also corresponded to the largest number of students (78) in the class. He seems to have addressed the students' primary concerns, as his average instructor rating was much higher in Spring 2018.

Dr. Tiwari's teaching at the graduate level has been consistently strong.

Research

Dr. Tiwari has established a very strong, externally funded research program at UT. Key metrics include:

- 12 peer-reviewed proceedings at highly selective conferences in rank (22 total).<sup>1</sup> He published 8 conference papers with his students/post-docs at UT.
- 2 archival journal publications in rank (6 total). He published one journal paper with his students/post-docs at UT.
- He has published papers in highly selective conferences related to computer architecture and computer security, including International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), ACM Conference on Computer and Communications Security (CCS), IEEE International Symposium on Hardware Oriented Security and Trust (HOST), International Symposium on High Performance Computer Architecture (HPCA), International Symposium on Computer Architecture (ISCA), International Symposium on Microarchitecture (MICRO), and USENIX Security Symposium.
- An h-index of 19 (Google Scholar) and 1,271 citations.<sup>2</sup>

While in rank, Dr. Tiwari has secured 15 research grants/gifts totaling more than \$5 million in external funding (his share is \$3.5 million) from a wide variety of sources including three federal agencies<sup>3</sup> and industry. He is the PI on 14 of the grants. Three of his current grants extend beyond the end of the 2018-19 academic year, including two from NSF and one from DARPA.

The letters from the external reviewers were positive and addressed the impact of Dr. Tiwari's work and his reputation as an emerging leader. One reviewer made comments that can be considered to be critical, but he qualified his observation and recommended promotion:

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<sup>1</sup> Refereed conference papers in highly selective conferences are the primary mechanism for disseminating research results in the fields of computer architecture and cyber security.

<sup>2</sup> Dr. Tiwari's most highly cited paper has 165 citations and is based on work completed during his graduate studies at UC-Santa Barbara. His most highly cited paper published in rank at UT has 78 citations.

<sup>3</sup> Defense Advanced Research Projects Agency (DARPA), National Science Foundation (NSF), and National Security Agency (NSA)

- John Kubiatawicz (Electrical Engineering and Computer Science, UC Berkeley) expressed some concerns about Dr. Tiwari's publication record, "his last 5 years have been fairly productive ... Mohit's paper count may be a bit lower than others in a similar position, but I'd say that it is more than sufficient."

#### Advising and Student Mentoring

Dr. Tiwari graduated one PhD student and three MS students. He co-mentored one postdoctoral fellow. He is currently advising seven PhD students (one co-supervised) and one MS student. He has also integrated undergraduate students into his research team with three to five students participating each year.

#### University Service

Dr. Tiwari's service to the university has primarily been related to faculty recruiting and graduate student recruiting. He has also been actively engaged in curriculum reform/development within ECE.

#### Professional Service

Dr. Tiwari is a member of several professional societies and actively serves on the program committees for top conferences in computer architecture and cybersecurity. He also serves as an associate editor for the *ACM Transactions of Code Optimization*.<sup>4</sup>

He contributes to the central Texas community by serving as a cybersecurity advisor for startups and Dell Children's Hospital.


#### Other Evidence of Merit or Recognition

Dr. Tiwari received a CAREER award from NSF in 2015 and he has received faculty research awards from Google (2014) and Qualcomm (2017). Several of his papers have been recognized with best paper awards.

#### Overall Assessment

Dr. Tiwari has established an outstanding reputation in computer architecture and cyber security. He has been extremely successful in securing external funding to sustain his research efforts. His teaching record is solid, and he is mentoring a large research group. He has provided excellent service to UT and professional communities within his field.

Overall, I believe that Dr. Tiwari's performance meets expectations in the area of teaching and exceeds expectations in the areas of research and service. Accordingly, I am pleased to provide my strong recommendation that Dr. Tiwari be promoted to associate professor with tenure.



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Sharon L. Wood, Dean  
10 November 2018

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<sup>4</sup> The editorial board for ACM TACO includes 22 associate editors from around the world.

**Candidate's Summary of Activities**  
**Mohit Tiwari**  
**Assistant Professor, ECE Department**  
**UT Austin**

<b>Metric</b>	<b>Value</b>
Peer-reviewed journal publications (in rank and total) ***	2+1 / 6+1
Peer-reviewed conference proceedings (in rank and total)	12 / 22
<b><i>Number of journal papers in rank with supervised student(s) and/or post-docs from UT as co-author(s) ***</i></b>	<b><i>1 + 1</i></b>
Number of journal papers in rank with supervised student(s) from UT as co-author ***	1 + 1
Total citations of all publications (career) from ISI Web of Knowledge *****	178
<b><i>Largest number of citations for a single paper based on work at UT (ISI Web of Knowledge) *****</i></b>	<b><i>29</i></b>
h-index (career) from ISI Web of Knowledge *****	7
Total citations of all publications (career) from Google Scholar (as of July 28, 2018)	1150
<b><i>Largest number of citations for a single paper based on work at UT (Google Scholar)</i></b>	<b><i>145</i></b>
h-index (career) from Google Scholar	18
Total external research funding raised in rank	\$ 5.05M
Total external research funding raised in rank (candidate's share)	\$ 3.56M
Total number of external grants/contracts awarded in rank	15
Number of external grants/contracts awarded in rank as PI	14
PhD students completed ( <i>sole supervisions and co-supervisions</i> )†	<b><i>1 / 0</i></b>
MS students completed ( <i>sole supervisions and co-supervisions</i> )†	<b><i>3 / 0</i></b>
PhD students in pipeline ( <i>sole supervisions and co-supervisions</i> as of 8/31/2018) †	<b><i>6 / 1</i></b>
MS students in pipeline ( <i>sole supervisions and co-supervisions</i> as of 8/31/2018) †	<b><i>1 / 0</i></b>
Number of courses taught	8
Total number of students taught in organized courses	291
Average instructor rating for undergraduate courses	4.05
Average instructor rating for graduate courses	4.25
Average course rating for undergraduate courses	3.85
Average course rating for graduate courses	4
Number of teaching awards	0
Student organizations advised	0
Undergraduate researchers supervised *****	13 + 1
Service on journal editorial boards	2
Number of symposia organized	1

**NOTES:**

\*\*\* +1: invited paper to Transactions on Computer Science (TOCS) based on ASPLOS'15 Best Paper Award ("Ghost rider: A hardware-software system for memory trace oblivious computation"). The paper has been invited and pre-accepted but it is in preparation and hence not listed in the CV.

\*\*\*\*\* ISI Web of Knowledge is missing crucial papers (#2 and #8 from Google Scholar ordered by citation count, and likely others); it has far lower citation counts than Google Scholar for the same papers, and has a different set of papers when ordered by citation count.

\*\*\*\*\* Undergraduate researchers list comprises of 11 funded summer and school-year positions, 2 unfunded students, and +1 is an undergraduate from Rice University.

Mohit Tiwari

**Budget Council Statement on Teaching for Faculty Promotion Candidate  
Mohit Tiwari**

This assessment of Assistant Professor Mohit Tiwari's teaching contributions was prepared by Budget Council Member Professor Jonathan Valvano.

**Principal area of teaching.**

Dr. Tiwari's principal area of teaching is in computer engineering in general and architecture, security, and embedded systems in specific. As an assistant professor, he has taught three different courses: two lower division required undergraduate classes and one advanced graduate class.

**Evaluation process.**

I based this statement on review of Dr. Tiwari's teaching statement and portfolio, personal experiences, in-class peer evaluations, student course/instructor evaluations for the last five years, as well as my own first-hand experience working together teaching different sections of the same class and my understanding of curricular matters because of my role on the ECE curriculum committee and as undergraduate advisor. I also personally observed his class on 3/6/2017 and 3/19/2018. I have co-taught EE319K with Professor Tiwari three times, and in so doing I have sat in EE319K planning/TA meetings with him dozens of times.

**Teaching Evaluation Procedures and Measures**

The department uses course evaluation surveys and peer evaluations. It is normal practice to conduct official course evaluations at the conclusion of every class. In spring semesters, EE319K is a large enrollment class with 5 sections. I was one of the instructors Spring 2015, Spring 2016, and Spring 2018 along with Professor Tiwari. Since we have shared homework, shared labs and shared exams, I can attest that Professor Tiwari's students were well-taught each of these three semesters. I think his teaching evaluations capture an accurate representation of his teaching.

Peer evaluations are conducted nominally once per academic year. Peer evaluations are made by tenured professors after a visit to the classroom. The times and dates of these visits are agreed to beforehand so that there are no surprise visits.

- Professor Valvano observed EE319K, Embedded Systems during Spring 2015
- Professor Akinwande observed EE319K, Embedded Systems during Spring 2016
- Professor Valvano observed EE319K, Embedded Systems during Spring 2017
- Professor Valvano observed EE319K, Embedded Systems during Spring 2018

**Summary of Teaching Evaluations**

The main indicator on the Course Evaluation Surveys used to evaluate teaching performance is the Overall Instructor Rating. His in-rank instructor ratings are summarized in Table 1. The GPA for EE319K, the undergraduate required class, is purposely adjusted to be about 3.0 for all sections. Also, this GPA is consistent with other classes at this level. Therefore, I believe there is no bias in evaluation scores caused by



Mohit Tiwari

perceived grade expectations. The average size of his graduate class is 14 students, slightly less than equal to the department average of 17.6.

His weighted average undergraduate instructor rating is 3.98 out of 5, and his weighted average graduate rating is 4.22 out of 5. His performance is less than the department average for undergraduate courses (Spring 2018 ECE average = 4.22) and slightly below the department average for graduate courses (Spring 2018 ECE average = 4.46). In summary, his undergraduate ratings are acceptable and his graduate instructor ratings are excellent.

Semester	Course	#Answered / #Enrolled	Overall instructor rating	Overall course rating
Spring 2015	EE 319K	26/41	3.8	3.6
Spring 2016	EE 319K	30/39	4.3	4.2
Spring 2017	EE 319K	18/78	3.5	3.3
Spring 2018	EE 319K	42/61	4.6	4.3
Spring 2015	EE309K	15/16	3.6	4.0
Fall 2013	EE 382V	9/9	4.5	4.5
Fall 2014	EE 382V	10/18	4.0	3.9
Fall 2015	EE 382V	13/19	4.2	3.8
Fall 2017	EE 382V	23/26	4.3	3.8

*Table 1. CIS results for undergraduate and graduate teaching. EE319K is Introduction to Embedded Systems, EE309K is System Security, and EE382V is Security Hardware-Software Interfaces.*

*Example negative comments from his CIS (undergrad EE309K)*

“Rarely showed up for class” (EE309K was team taught)

EE309K was not a traditional lecture course. EE309K was the number that ECE students used when taking the freshman research initiative stream involving system security. Dr Tiwari was involved in organizing this effort, but was not the lead teacher. The CIS numbers reflect that the students felt positive about the opportunity but may have been confused on how to rate Dr. Tiwari as the instructor. Including just his EE319K courses, his weighted undergraduate instructor CIS average is 4.01.

*Typical positive comments from his CIS (undergrad EE319K)*

“learned a lot”

“constantly challenged us with class problems”

“awesome”

“lectures were great and well organized”

“super approachable”

Mohit Tiwari

“very approachable”  
“knowledgeable and excited about course material”  
“encouraged to take control of my own learning”  
“cares about his students”  
“extremely passionate about both the course material and helping students learn”

*Typical negative comments from his CIS (undergrad EE319K)*

“covering more material from labs would be beneficial”  
“not well-structured”  
“put more emphasis on lab related course material”  
“he has bad handwriting”  
“the first lectures were good, the quality continually declined; do not regret skipping”

*Typical positive comments from his CIS (grad EE382V)*

“Enthusiastic”  
“Learned a lot”  
“Explains very clearly”  
“was very effective”  
“enjoyed the discussions”  
“one of the best teachers so far”

*Example negative comments from his CIS (grad EE382V)*

“Much of the material... went over my head”  
“This course was incredibly difficult and time consuming”  
“Labs were disorganized, but I learned from them”  
“could be more structured”  
“need to be more organized”

**Summarizing quotes from Professor Valvano’s Spring 2015 visit (exact date unknown)**

“Lectures are extremely engaging. He gives a high-level overview of what they will be learning and how the educational components fit together. During lecture, he can get lost in the calculations and would benefit by working out the details in advance.”

**Summarizing quotes from Professor Akinwande’s in class visit. April 6, 2016**

“He spoke in a very casual sense that was very interactive with the students and approachable. The instructor repeated student questions to ensure it was clear to all. The lecture was often very interactive in that many students could respond to or ask questions without the need to raise hands. It was a very engaging lecture on Analog to Digital conversion and Sampling theorem. Examples were solved together in class. There were also in-class practice programming functions. Afterward, the programming concepts and methods were discussed collectively.”

**Summarizing quotes from Professor Valvano’s in class visit. March 6, 2017**

“He used a mixture of PowerPoint slides and blackboard. The students were very engaged with the game example and later, they were engaged with the prospect of creating sound. Students felt safe to ask and answer questions.” *Negatives:*



Mohit Tiwari

“Write things on the board you want them to copy into their notes. Your message on the blackboard can be scattered.”

**Summarizing quotes from Professor Valvano’s in class visit. March 19, 2018**

“He was very positive responding to students (“great, great, great”, “that is wonderful”, smiling, “great, that is a very good question”). His delivery was articulate. He used PowerPoint slides for structure, but wrote a lot on the white board. He paused frequently and asked for questions. He did an in-class short quiz to see if students understood the key concepts (just 5 minutes). The professor and TAs walked around answering questions.” *Negatives*: “White board management and size of writing. From the weekly meetings, I see he teaches more basic fundamentals rather than delve into the details of how to execute lab assignments. Consequently, his students may learn more, but require more effort to figure out stuff on their own (and may have contributed to the lower scores).”

**Response to Student and Peer Evaluation Leads to Continuous Improvement**

There are not a lot of negative comments about Professor Tiwari’s teaching, but one theme that exists is his lecture organization. Both peer review and student evaluations suggest he work on organizing his lectures. When he made adjustments to his lecture, the response was positive.

One of the difficult concepts in EE319K is teaching C programming to students with no prior programming experience other than EE306/BME303. Basically, the problem is there are some students with extensive programming experience and others who just have this one prerequisite class (EE306/BME303) on assembly programming and computer architecture. Professor Tiwari approaches teaching software design first by example and then by having students work exercises in class. His students appreciated his desire to make them think beyond the details of the course.

**Teaching Portfolio**

There are three aspects of Professor Mohit Tiwari’s teaching portfolio that demonstrate he is an effective and passionate educator. First, it is clear he cares about his students individually. He demonstrates a sincere desire that they learn, and rejoices when they do. Second, he is willing to experiment with his teaching style. He not only tries new approaches but also evaluates the outcomes of the effort to know what works and what doesn’t work. Third, he has a fundamental grasp of both the level of our student population and what our students need to be successful in their careers. He uses these insights to design an effective approach when teaching his courses.

**Comparison to Other Assistant Professors in the Department:**

The CIS scores for Dr. Tiwari are slightly lower than the other assistant professors. However, his teaching service (new course on security, and the freshman research initiative stream) place him on or above efforts from other assistant professors in the department.

Mohit Tiwari

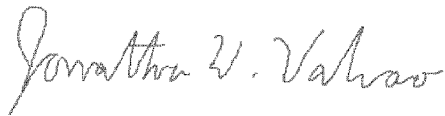
**Describe participation on graduate committees**

Professor Mohit Tiwari has one PhD student who passed the defense. He has one PhD student in candidacy. He has eight PhD-bound students in the pipeline. He supervised three MS thesis students in rank that have graduated.

**Conclusions**

There are many dimensions to the teaching contributions of a professor, some measurable quantitatively, some measurable qualitatively. On every dimension, Professor Tiwari's contributions put him well above the bar: his approach to teaching not only what but why, his passion for getting students to learn, his mentoring of individual students, his desire to improve his classroom teaching skills, and his constant desire to innovate his teaching. Professor Tiwari demonstrates the excellence that clearly supports this promotion.

Summary prepared by Budget Council Member Professor Jonathan Valvano.

A handwritten signature in cursive script that reads "Jonathan V. Valvano". The signature is written in dark ink and is positioned above the printed name of the signatory.

Jonathan Valvano

Mohit Tiwari  
Department of Electrical and Computer Engineering  
Course Rating Averages

**Mohit Tiwari (mt28295). Assistant Professor. ECE Department.**

What source was used to complete this chart? My CIS

**EE319K: Introduction to Embedded Systems**

Semester	Class Size	Number of Responses	Instructor Rating	Course Rating
Spring 2015	41	26	3.8	3.6
Spring 2016	39	30	4.3	4.2
Spring 2017	78	18*	3.5	3.3
Spring 2018	61	42	4.6	4.3
<b>Mean</b>	<b>55</b>	<b>33</b>	<b>4.05</b>	<b>3.85</b>

\* CIS forms completed electronically outside of class. Hence the low turnout compared to other years.

**EE 382V: Security at the Hardware-Software Interface**

Semester	Class Size	Number of Responses	Instructor Rating	Course Rating
Fall 2013	9	9	4.5	4.5
Fall 2014	18	10	4.0	3.9
Fall 2015	19	13	4.2	3.8
Fall 2017	26	23	4.3	3.8
<b>Mean</b>	<b>18</b>	<b>14</b>	<b>4.25</b>	<b>4.00</b>

**EE309K, CS 378: Systems Security Freshman Research Initiative (FRI) Stream**

Semester	Class Size	Number of Responses	Instructor Rating	Course Rating
Spring 2015	16	15	3.6	4.0
Fall 2015	15	3	3.0	3.3
Fall 2016	10	2	5.0	4.5
<b>Mean</b>	<b>14</b>	<b>7</b>	<b>3.87</b>	<b>3.93</b>

**Note: FRI courses are taught by Research Educator (RE) with me as a mentor. My CIS scores here are thus not representative of my undergraduate teaching.**

**Table 1. Research Summary**

<b>Metric</b>	<b>Value</b>
Peer-reviewed journal publications (in rank and total) ***	2+1 / 6+1
Peer-reviewed ( <i>journal-equivalent</i> ) conference proceedings (in rank and total)	12 / 22
Number of journal papers in rank with supervised student(s) and/or post-docs from UT as co-author(s)* ***	1+1
Number of journal papers in rank with supervised student(s) from UT as co-author* ***	1+1
Number of <i>journal-equivalent conference</i> papers in rank with supervised student(s) and/or post-docs from UT as co-author(s)*	8
Number of <i>journal-equivalent conference</i> papers in rank with supervised student(s) from UT as co-author*	7
Total citations of all publications (career) from ISI Web of Knowledge*****	178
Largest number of citations for a single paper based on work at UT (ISI Web of Knowledge)*****	29
h-index (career) from ISI Web of Knowledge*****	7
Total citations of all publications (career) from Google Scholar ( <i>as of July 1, 2018</i> )	1119
Largest number of citations for a single paper based on work at UT (Google Scholar)	143
h-index (career) from Google Scholar	18
Total external research funding raised in rank (personal/total for UT)	\$3.56M/\$5.05M

**NOTES:**

\*\*\* +1: invited paper to Transactions on Computer Science (TOCS) based on ASPLOS'15 Best Paper Award ("Ghostrider: A hardware-software system for memory trace oblivious computation").

\*\*\*\*\* ISI Web of Knowledge is missing crucial papers (#2 and #8 from Google Scholar ordered by citation count, and likely others); it has far lower citation counts than Google Scholar for the same papers and has a different set of papers when ordered by citation count.

**Table 2. Current External Grants and Contracts**

<b>Role of Candidate and Co-Investigators</b>	<b>Title</b>	<b>Agency</b>	<b>Project Total</b>	<b>Candidate's Share</b>	<b>Grant Period</b>
PI: Mohit Tiwari	CAREER: Exo-Core: An Architecture to Detect Malware as Computational Anomalies	NSF CAREER	522,000	522,000	2015—2020
PI: Mohit Tiwari	SaTC: CORE: Medium: Guarding Noisy Neighborhoods with Weak Detectors	NSF	1,200,000	400,000	2017—2021
Co-PIs: Sanjay Shakkottai, Constantine Caramanis					
PI: Christine Julien	CSR: Medium: Extensible Distributed Systems Solutions for Community Supported Child-Independent Mobility	NSF	400,000	200,000	2017—2019
Co-PI: Mohit Tiwari					
PI: Mohit Tiwari	Cyber Security Research on Power Models	Lockheed Martin	500,000	166,000	2016—2018
Co-PIs: Michael Orshansky, Andreas Gerstlauer					
PI: Mohit Tiwari	Mobile Data Container	General Dynamics	166,000	166,000	2017—2019
PI: Mohit Tiwari	Ensembles of Moving Target Defenses for Scalable and Composable Hardware Security	DARPA	748,556	748,556	2018—2021
PI: Mohit Tiwari	Fine-Grained Contention Detection and Mitigation	Huawei-CS Systems Lab	124,000	62,000	2018—2019
Co-PI: Mattan Erez					
PI: Mohit Tiwari	PSigns: Power Channels for Malware Detection	Google award	50,000	25,000	gift
Co-PI: Vijay Reddi					
PI Mohit Tiwari	Hardware-based Malware Detection, Faculty award	Qualcomm award	125,000	125,000	gift
PI: Mohit Tiwari	Anomaly Detection for Cloud Radio Access Network	Huawei-WNCG	100,000	30,000	WNCG gift
Co-PIs: Sanjay Shakkottai, Constantine Caramanis					
<b>Total</b>			<b>3,935,556</b>	<b>2,444,556</b>	

Electrical and Computer Engineering

Revised September 17, 2018

**GRANTS AND CONTRACTS:** Total funding \$5,049,282 at UT.  
My share \$3,558,282 at UT.

Acronyms in table below (in order of appearance in table):

- NSF: National Science Foundation
- SaTC: Secure and Trustworthy Cyberspace
- NSA: National Security Agency
- UMD: University of Maryland
- CAREER: Faculty Early Career Development Program
- C-FAR: Center for Future Architectures Research (<https://www.futurearchs.org/>)
- I-Corps: NSF Innovation Corps
- DARPA: Defense Advanced Research Projects Agency
- SSITH: System Security Integrated Through Hardware and Firmware
- NSF CSR: National Science Foundation Computer Systems Research

Co-Investigators	Title	Agency	Grant Total	Period
None	"Digital Insertion and Observation Resistant Execution (DIORE)"	NSF SaTC program	\$416,000	08/01/13 – 07/31/17
None	"Human Reasoning about Privacy and Security"	NSA Lablet at UMD	\$62,726	02/07/14 - 07/31/17
V.J. Reddi	Power Signatures for Mobile Malware Detection	Google Research Award	\$50,000 (\$25,000 total PI share)	2014
None	"Exo-Core: An Architecture to Detect Malware as Computational Anomalies"	NSF CAREER award	\$522,000	03/01/15 - 02/29/20
None	"Architectures to Protect Data in Motion"	C-FAR Center UMichigan	\$485,000	05/07/15 – 12/31/17
None	"I-Corps: Trustworthy Cyberspace through Data-security as a Service"	NSF I-Corps	\$50,000	09/01/15 - 02/29/16
M. Orshansky, A. Gerstlauer	"Cybersecurity Research on Power Models"	Lockheed Martin	\$500,000 (\$166,000 total PI share)	10/31/16 - 08/15/18
S. Shakkottai, C. Caramanis	Anomaly Detection for Cloud Radio Access Network (Cloud-RAN)	Huawei	\$100,000 (\$30,000 total PI share)	2016

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None	"Hardware Introspection Mechanisms for Debugging and Security"	Samsung	\$100,000	01/31/16 – 06/01/17
S. Shakkottai, C. Caramanis	"SaTC: CORE: Medium: Guarding Noisy Neighborhoods with Weak Detectors"	NSF SaTC	\$1,200,000 (\$400,000 total PI share)	03/01/17 - 02/29/21
None	Malware Detection	Qualcomm gift, Faculty Award	\$125,000	2017
None	Mobile Data Containers	General Dynamics	\$166,000	06/30/17 – 08/31/19
None	Ensembles of Moving Target Defenses	DARPA SSITH program	\$748,556	10/31/17 - 01/15/21
PI C. Julien	CSR: Medium: Extensible Distributed Systems Solutions for Community Supported Child-Independent Mobility"	NSF CSR #1703497	\$400,000 (\$200,000 total PI share)	09/01/17 - 08/31/19
Mattan Erez	Fine-grained Contention Detection and Mitigation	Huawei CS Systems Lab	\$124,000 (\$62,000 total PI share)	08/01/18 - 07/31/19

## PH.D. SUPERVISIONS COMPLETED:

Kazdagli, Mikhail	June 2018	Robust Behavioral Malware Detection	Electrical and Computer Engineering	The University of Texas at Austin
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**Table 3. External Grants and Contracts Awarded in Rank and Completed**

<b>Role of Candidate and Co-Investigators</b>	<b>Title</b>	<b>Agency</b>	<b>Project Total</b>	<b>Candidate's Share</b>	<b>Grant Period</b>
PI: Mohit Tiwari	TWC: Medium: Collaborative Research: DIORE: Digital Insertion and Observation Resistant Execution	NSF	416,000	416,000	2013—2017
PI: Mohit Tiwari	Establishing a Science of Security Research Lablet at The University of Maryland - Human Reasoning about Privacy and Security	NSA	62,726	62,726	2014—2017
PI: Mohit Tiwari	Hardware Introspection Mechanisms for Debugging and Security	Samsung	100,000	100,000	2016—2017
PI: Mohit Tiwari	I-Corps: Trustworthy Cyberspace through Data-security as a Service	NSF	50,000	50,000	2015—2016
PI: Mohit Tiwari	Architectures to Protect Data in Motion	C-FAR Center at University of Michigan	485,000	485,000	2015—2017
<b>TOTAL</b>			<b>1,113,726</b>	<b>1,113,726</b>	

**Table 4. Pending External Grants and Contracts**

<b>Role of Candidate and Co-Investigators</b>	<b>Title</b>	<b>Agency</b>	<b>Project Total</b>	<b>Candidate's Share</b>	<b>Grant Period</b>
PI: Mohit Tiwari (UIUC Co-PI: Chris Fletcher)	Intel ISRA: Oblivious Instruction Set Architectures	Intel	300,000	300,000	2018—2021
PI: Mohit Tiwari (UIUC Co-PI: Chris Fletcher)	SaTC: CORE: Small: Collaborative: Oblivious ISAs for Secure and Efficient Enclave Programming	NSF	500,000	250,000	2018—2021
PI: Mohit Tiwari	Mobile Data Containers Year 2	General Dynamics	217,000	217,000	2018—2019
PI: Mohit Tiwari	Cyber Security Research on Power Models	Lockheed Martin	250,000	83,000	2018—2019
Co-PIs: Michael Orshansky, Andreas Gerstlauer					
<b>TOTAL</b>			<b>1,267,000</b>	<b>850,000</b>	